



National Renewable Energy Laboratory

Technology Options for Rural Electricity

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Technology/System Determinants:

- application
- renewable resources
- economics of competing conventional options
- physical dispersity of loads
- quality of service
- institutional considerations

Applications:

- lighting
- household appliances
- water pumping, potable and irrigation
- water treatment/desalination
- cold storage/refrigeration/ice making
- health clinics
- schools
- power tools and village industry
- agro-processing
- communications

Resources:

- solar
- wind
- hydro
- biomass
- geothermal



Types of Village Power Systems

- General categories

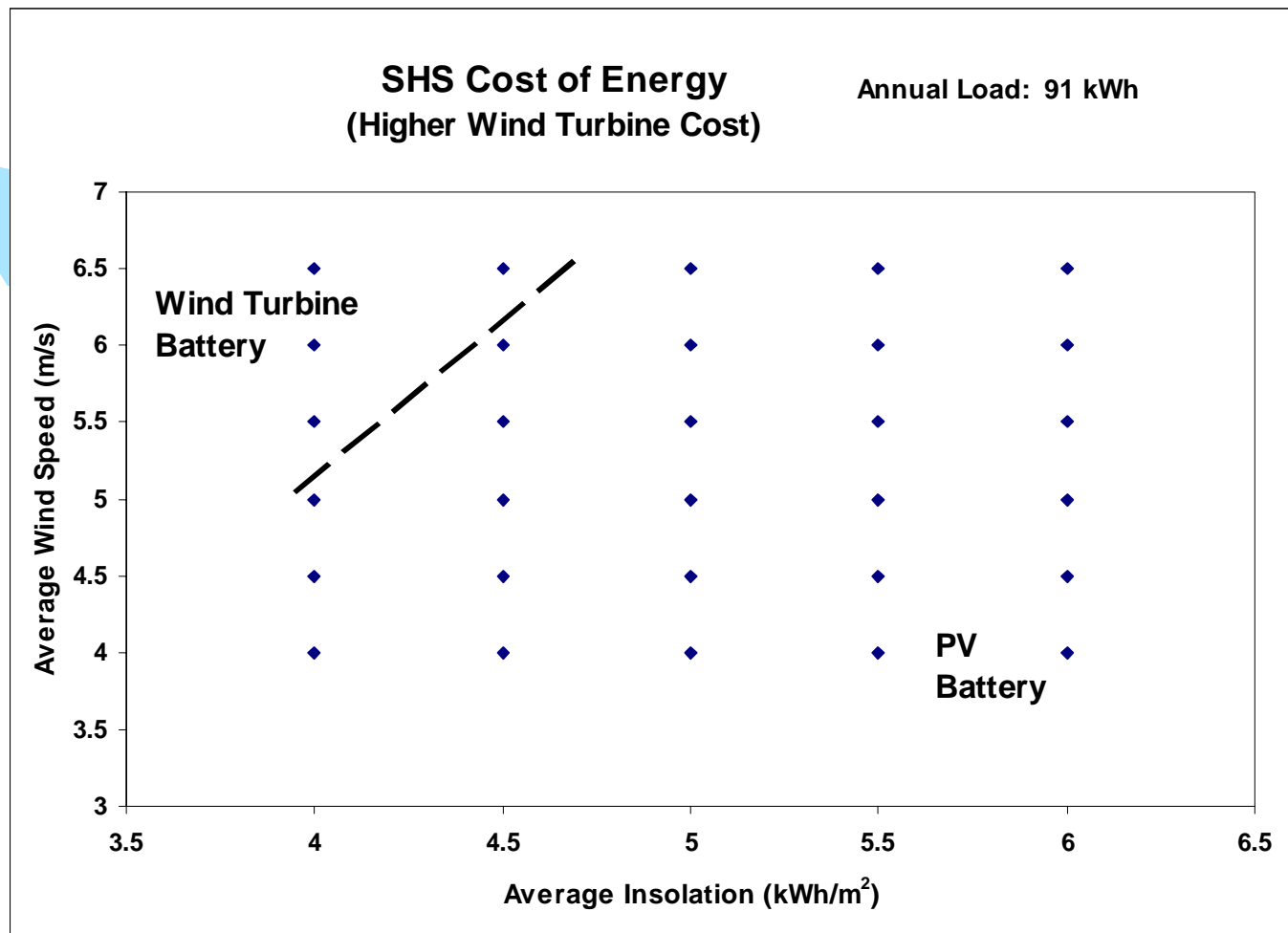
- Individual systems - compete with PV

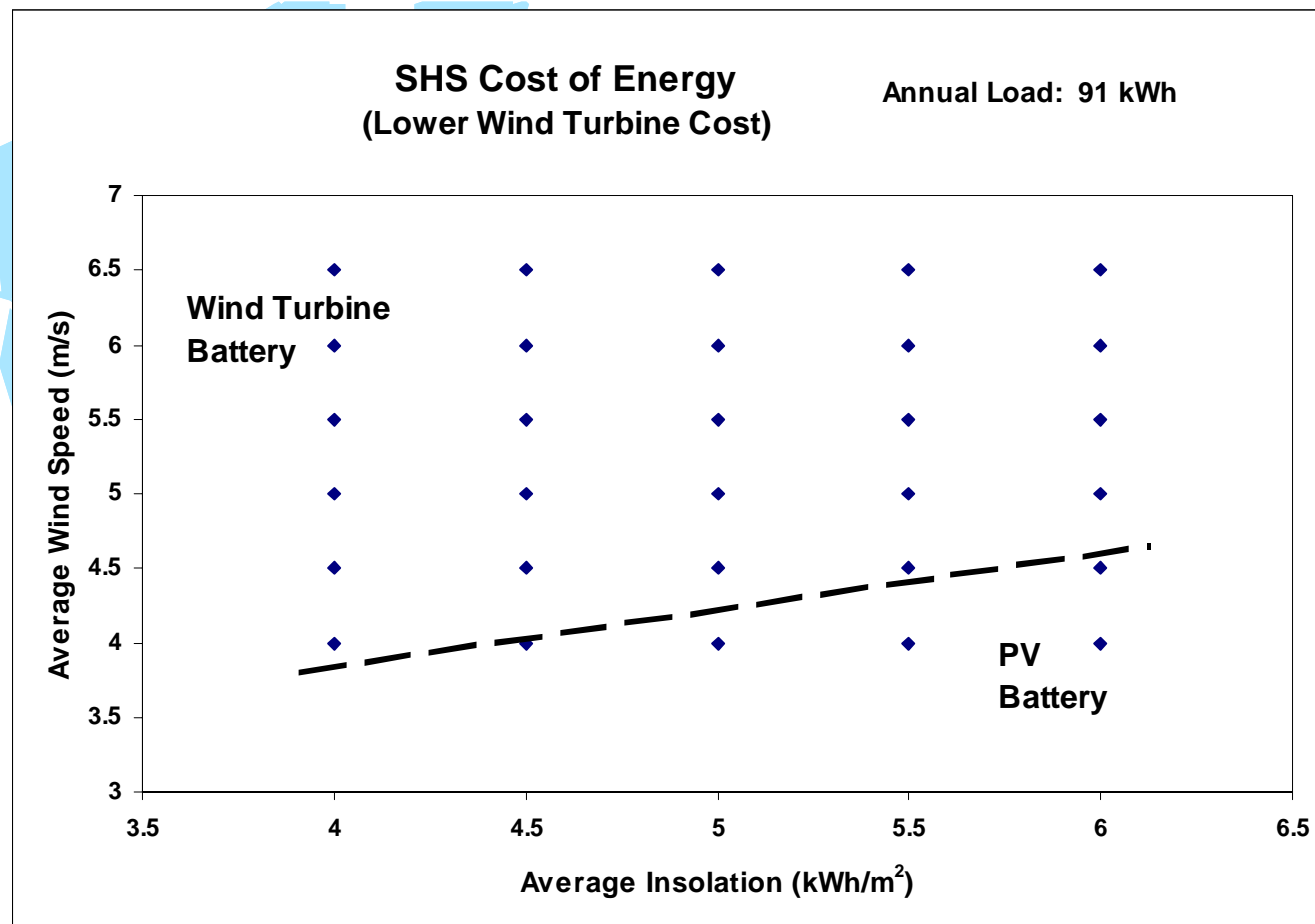
- Micro-grids - Storage is primary backup

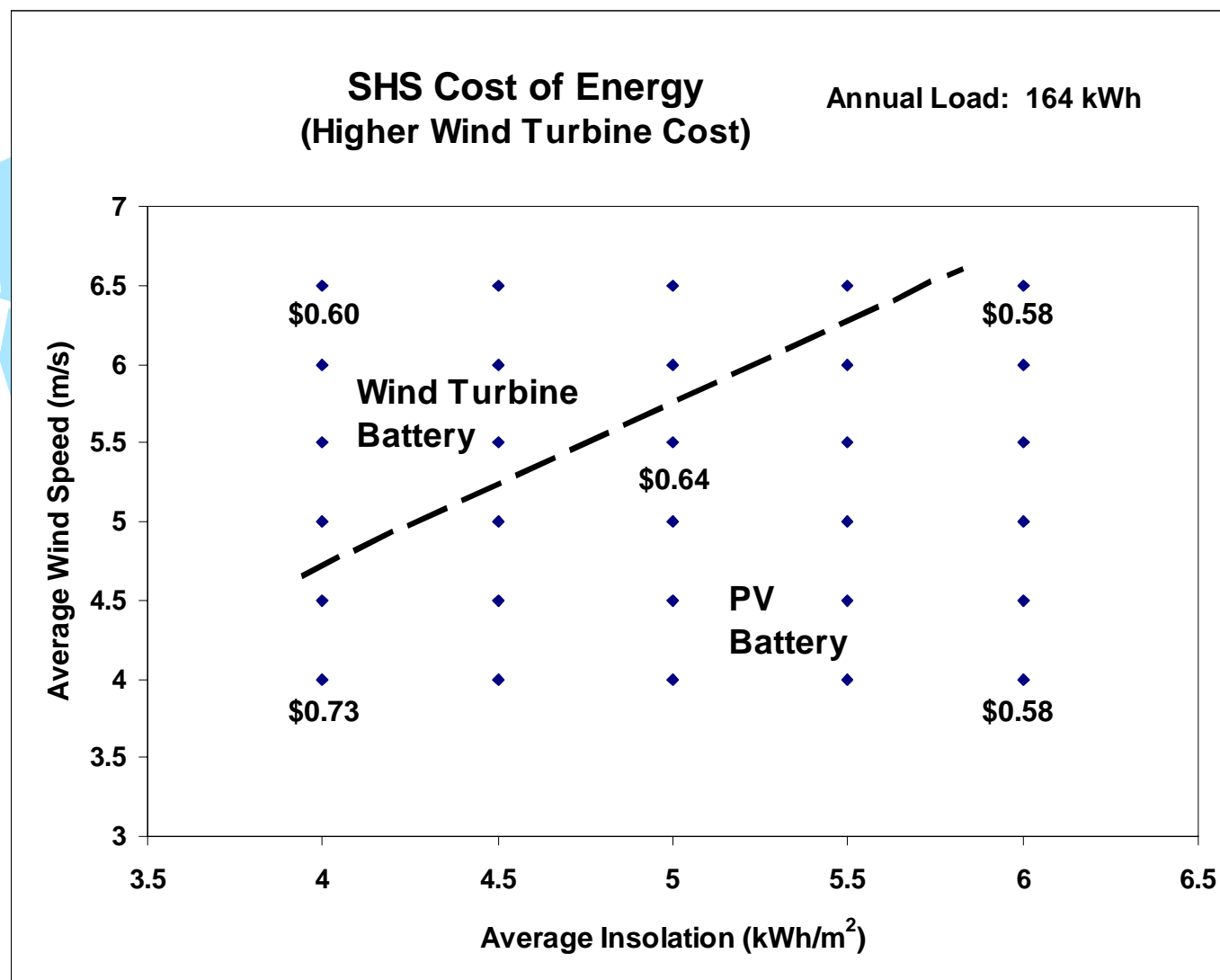
- Mini-grids - Diesel is primary backup

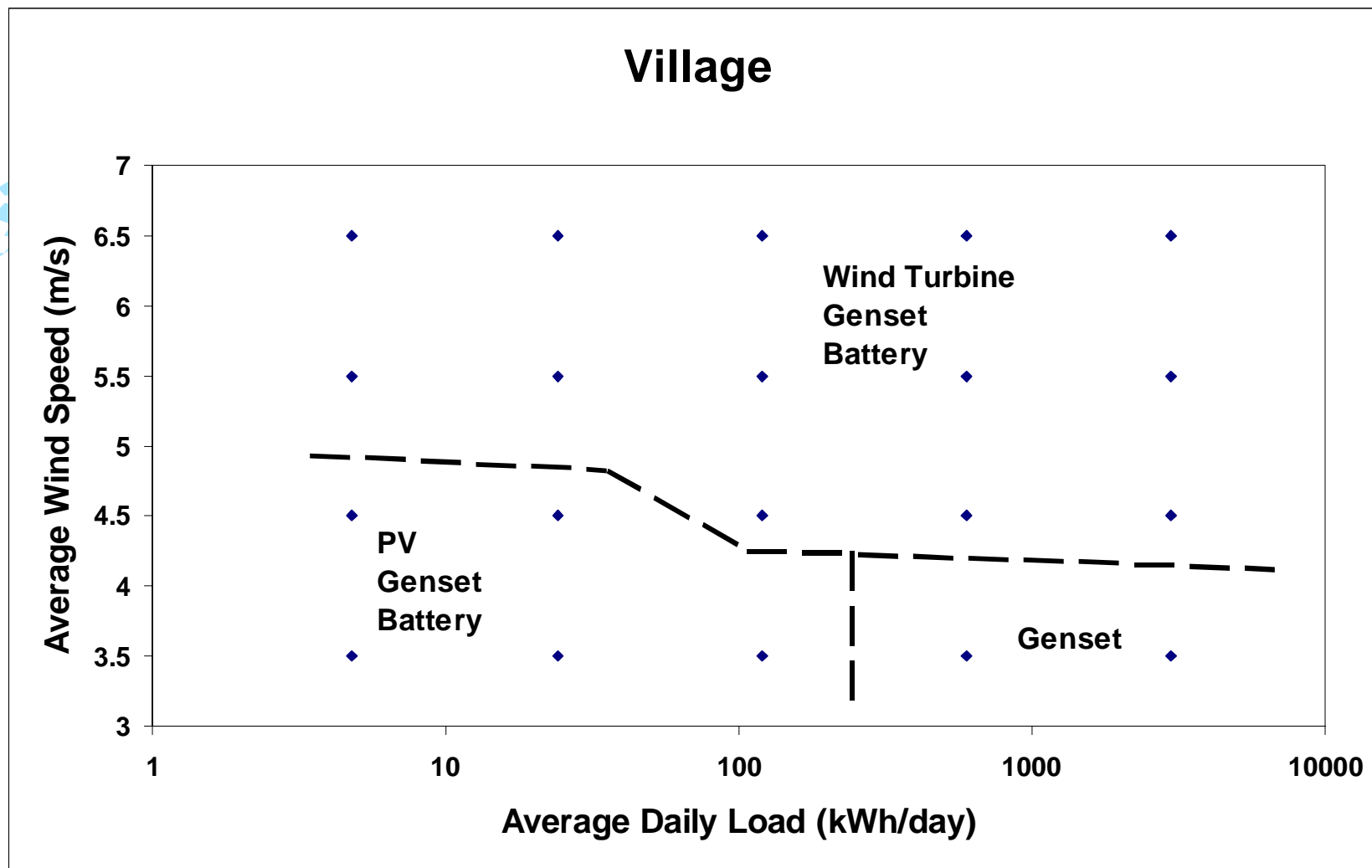
- Interconnected diesels - Multiple diesel dispatch, T&D

One region may contain a mixture of types

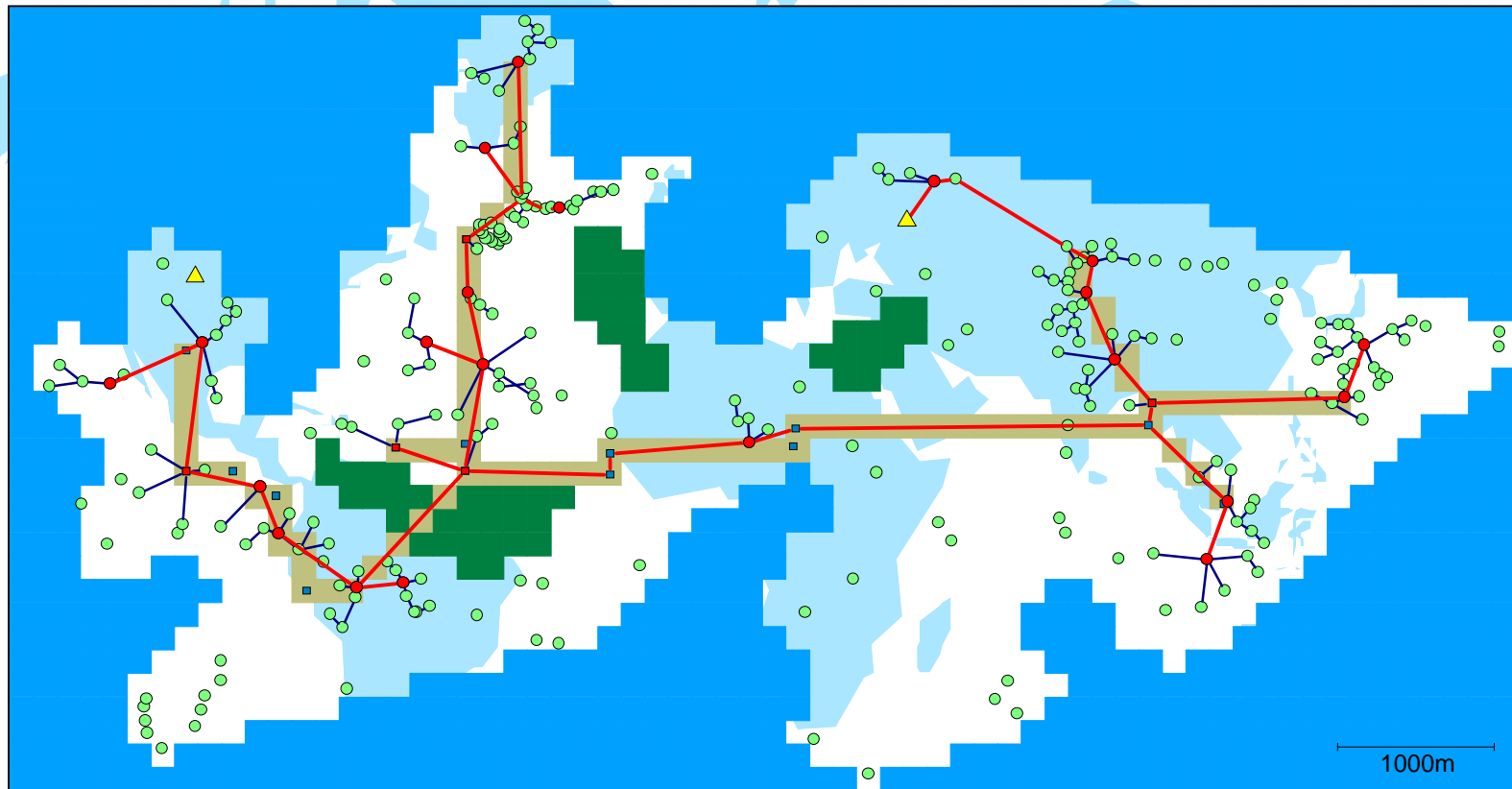






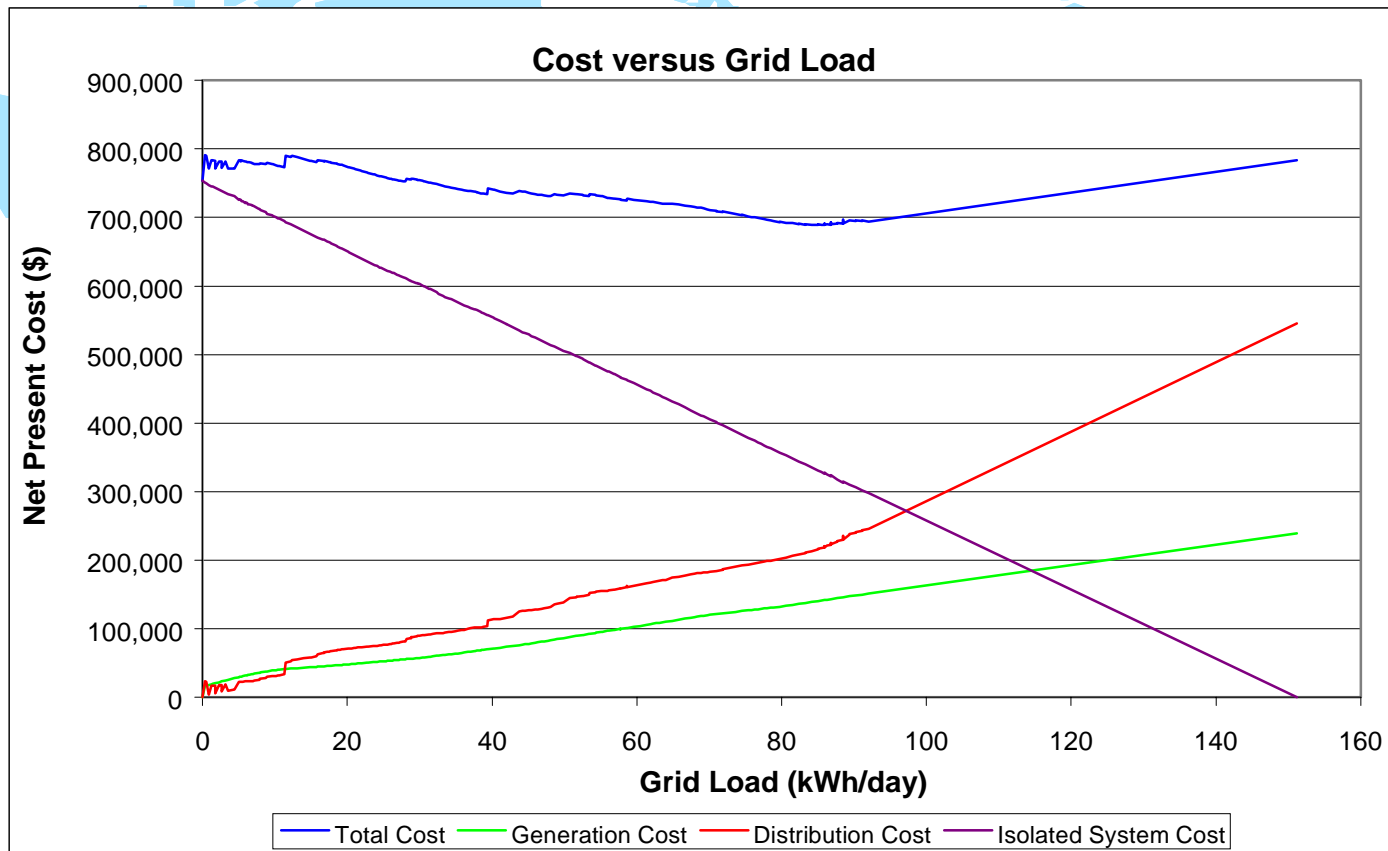


Isla Quehui, Chile





Isla Tranqui, Chile



Technology Requirements:

- 
- A light blue silhouette of a world map is positioned in the background, centered behind the text. It shows the outlines of all major continents and some smaller islands.
- economically competitive
 - reliable
 - serviceable
 - load matching
 - scaleable

Institutional Issues:

- ownership
- operations and maintenance
- financing
- tariff design
- metering
- ability and willingness to pay
- training



Institutional Issues (cont.):

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- A light blue silhouette of a world map is positioned in the background, centered behind the list of institutional issues.
- load growth
 - quality of service
 - economic development vs. social services
 - cultural response
 - institutional cooperation

Future Technology Developments:

- lower cost solutions
- more robust systems
- more options:
 - small-scale biomass gasification
 - concentrated solar-sterling engine
 - small scale geothermal
 - hybrids
 - mixed systems
 - integrated systems

Future Technology Developments (cont):

- applications development
- storage subsystem development
- smarter controls

Summary: Technology and the system are the dependent variables; the application, the resource, the economics, and the institutional aspects are the drivers.

Therefore: We need to focus, not on the technology, but on the applications and resources and present the options that most appropriately meet the village applications and needs.